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THE RELATION OF STUMP HEIGHT TO THE SPROUTING OF HOP HORNBEAM IN NORTHERN INDIANA

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In the management of hardwood stands the control of sprouting is of major importance. This may involve the encouragement of sprouting in certain species and its suppression in others. In weeding, cleaning, or thinning young stands, or in the work of stand improvement now being undertaken on a large scale by C.C.C. labor, a knowledge of the sprouting capacity of the various tree species is very desirable and important.

Sprouting ability differs greatly with species. Some species sprout vigorously under a variety of conditions, others only under very favorable circumstances. Certain trees sprout from the roots, others only from the main stem. In some species adventitious buds are most important in the origin of sprouts, while in others dormant buds play a leading role. The literature on the subject of sprouting is neither abundant nor conclusive. Scarcely enough data have been collected on the various species to classify trees in the order of their sprouting ability. It is obvious, therefore, that additional data on the behavior of individual species under various conditions are necessary.

Little is known regarding the relation of height of stumps to the number and vitality of the sprouts which they may support. That this depends very largely on the species under consideration, has been brought out by a cutting experiment carried on in northern Indiana during the last two seasons. The Station's first effort in its sprouting investigation was started in a small way by a study of hop hornbeam (Ostrya virginiana) (Mill.) K. Koch. This species is undoubtedly the most important weed tree in the farm woodlands of the Corn Belt. In many areas it dominates the understory so completely that the reproduction of the more valuable trees is often suppressed or prevented from becoming established. As many as 2,500 stems per acre of hornbeams under three inches in diameter have been found in a number of unmanaged farmwoods. Obviously then, any method of cutting which tends to discourage sprout formation is desirable, and it was with this purpose in mind that this experiment was undertaken.

Methods. This study has been carried on in three locations in northern Indiana. On August 6, 1933, a total of 833 hop hornbeam saplings were cut* in a beech-maple woodland in Grant County. The trees were cut at nine different stump heights, starting with stumps at the ground surface and increasing the height at six-inch intervals up to four feet above the ground. One month later in the same woodland the experiment was

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*The field work was done with the assistance of Mr. E. D. Marshall, formerly Field Assistant, Purdue Agricultural Experiment Station.

repeated with 919 trees. Also during this month, in a beech-maple woodland in DeKalb County, 764 trees were removed, all of which were cut at the ground level, making a total of 1,683 trees cut in September, 1933. On July 10, 1934, two additional plots were established in an oak-hickory woodland in Cass County, in which 165 trees were cut at the ground level and 100 trees cut at a six-inch stump height. A scissors type of pruner was used in cutting the saplings, which ranged from 0.5 to 2.5 inches in diameter.

Results. The first remeasurements were made in July, 1934, and during the latter part of May, 1935, all the plots were again remeasured. The results obtained from the July, August, and September cuttings were very similar and, therefore, all the data are summarized in one graph and table. These show a very striking relationship between the number of trees killed and the height at which they were cut. For example, it can be seen that approximately 83% of the trees which were cut at the ground surface failed to sprout, in contrast to less than 10% at the 24-inch stump height.

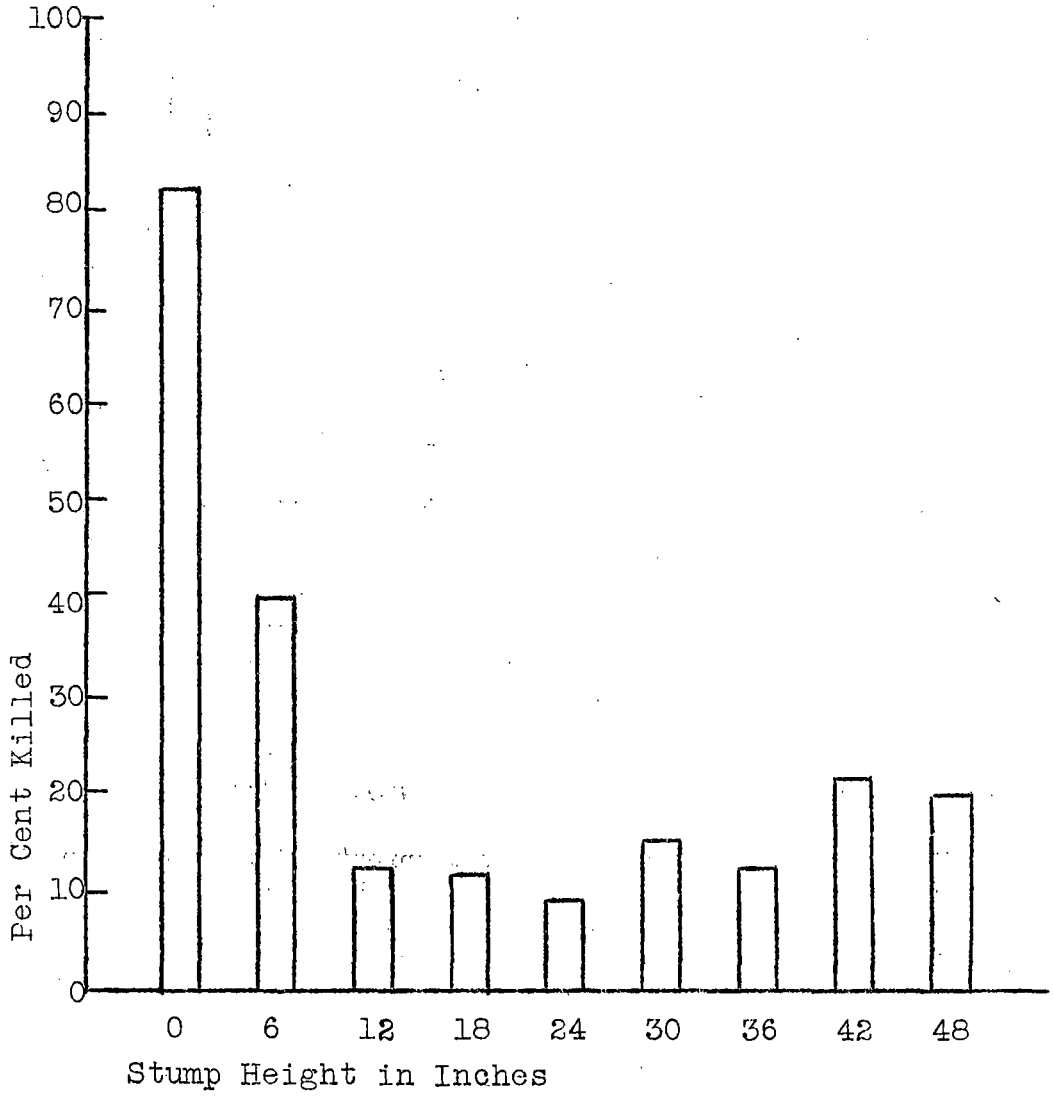
The reason for the 83% effective kill which resulted when the trees were cut at the ground surface is probably due to the fact that the sprouts originated only from the main stems and not from the roots. This is apparently the reason why the trees cut at the ground surface showed much less sprouting than the trees cut at higher stump heights. The slight increase in mortality obtained at heights above 24 inches is difficult to explain. It is probably due to some little understood phenomenon of apical dominance, polarity, or equilibrium of some sort between the top and roots.

It is commonly believed that the sprouts of most tree species come from adventitious buds. In the case of hop hornbeam, however, it was possible to trace the pith of all the sprouts examined to the center of the main stem. This indicates that these sprouts came from dormant axillary buds which remained alive from one year to the next and became active when that part of the shoot above them was removed. Most of the trees which were cut were between the ages of 10 and 20 years and were less than 2.5 inches in diameter. Whether this type of bud is responsible for sprouts which come from hop hornbeams larger than 2.5 inches in diameter has not been investigated.

Although the data obtained to date in northern Indiana were secured during two consecutive dry seasons, it appears that the best height at which to cut hop hornbeam in this section is at the ground surface. The few larger trees which were girdled at varying heights gave similar results and indicated that the best height at which to girdle the larger trees is also at the ground surface.

Besides the specific anatomical properties which influence sprouting capacity, it is realized that a number of interrelating factors, such as climate, soil conditions, age and condition of tree, and time of cutting, are involved in this problem. Before any general conclusions can be drawn, therefore, it is necessary that intensive studies be made on individual species over a wide range of conditions.

The Relation of the Per Cent of Trees Killed to Stump Height of Hop Hornbeam



Stump Height	Trees Cut	Trees which Failed to Sprout	
Inches	Number	Number	Per Cent
0	1,110	917	82.6
6	311	126	40.5
12	165	21	12.7
18	195	23	11.8
24	260	25	9.6
30	195	29	14.9
36	192	24	12.5
42	172	37	21.5
48	181	36	19.9